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Turbidity Concentrations and Suspended Sediment Discharge
in Streams in Southeastern Idaho

by

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ABSTRACT:

Biweekly water samples were collected for turbidity testing from March through September, 1975, at 50 different stream locations in Southeast Idaho. Thirteen stream locations were sampled in 1976, of which 12 had been sampled the previous year. High stream turbidity occurred in the lower sections of all major streams in Southeastern Idaho during the sampling period.

In the Snake River, the Tilden Bridge area contained the highest concentrations at 55 and 80 NTU's in March, 1976. The highest concentrations in the Portneuf River occurred at the Interstate 80 Bridge when 94 and 150 NTU's occurred **in** early March and mid-May 1975 respectively. The highest concentration found in the Blackfoot River was 275 NTU's in mid-March, 1976, at the Interstate 15 Bridge. Areas of high turbidity concentrations in Bear River were located at Weston Bridge where 100 NTU's were present **in** mid-July, 1976; Cleveland Bridge where 110 NTU's were present during early August, 1976; Bennington Bridge where 175 NTU's were present during early August, 1975; and Border Bridge where 120 NTU's were present in early April, 1975.

Correlations between turbidity and suspended sediment were excellent in the Portneuf River, Blackfoot River, and Bear River. Correlation coefficients in each of these streams were .99464, .87131, and .97116, respectively. The suspended sediment concentration for each stream can be calculated from a turbidity value and the linear regression formula developed.

The highest monthly suspended sediment discharge in the Portneuf River, a total of 31,291 tons, occurred at the Interstate 80 Bridge in May, 1975. The highest monthly suspended sediment discharge in the Blackfoot River, a total of 43,067 tons, occurred at the Interstate 80 Bridge in May, 1975. The highest monthly suspended sediment discharge in Bear River, a total of 36,063 tons, occurred at the Highway 91 Bridge in May, 1975.

INTRODUCTION

High stream turbidity has been a problem affecting trout populations in eastern Idaho for many years. The wide stream valleys and moderately sloping adjacent hills are often tilled, resulting in increased soil erosion, stream turbidity and sediment. Sediment affects fish populations by smothering developing alevins, lowering the number of bottom organisms and aquatic plants, clogging fishes gills and by physically changing the stream's pools and riffles.

Numerous studies documenting the effects of silt on fish populations have been done with an excellent review by Cordone and Kelly (1961). Most sediment studies in the western United States have been associated with logging operations, Gibbons and Salo (1973). The U.S. Environmental Protection Agency has published various reports concerning methods of identifying, evaluating and controlling nonpoint agricultural pollution (1973a and 1973b).

METHODS

Water samples for turbidity testing were collected at various locations along the Snake River in Region 5, Blackfoot River and tributaries, Portneuf River and tributaries, and Bear River and tributaries during 1975 and 1976. Samples were collected at each station twice per month during the period of sampling (March through September). The first sampling period in each month was from the first day through the fourth and the second period from the fifteenth day through the eighteenth. Enforcement Bureau personnel collected the water samples during the study.

Water samples were collected by the grab method in 250 ml. plastic bottles. The sample was agitated and a measured amount tested using a Hach Laboratory Turbidimeter, Model 2100A. All results are expressed in NTU's.

Nonfilterable solids (suspended solids or suspended sediment) was determined using the methods outlined in Standard Methods (1971). Specifically, Metricel ᵗᵐ 1.2 micron glass filters were dried at 60^{0} C. in a drying oven for two hours and then placed in a dessicator to cool. They were then weighed to the nearest 0.1 mg. The water was measured to the nearest ml. and poured into the Millipore filter apparatus with the tarred filter in place. The filter was then placed back in the drying oven for a period of 24 hours, removed to a dessicator, cooled and reweighed. The difference is the amount of nonfilterable solids or suspended solids in that amount of water. The amount of water filtered was divided into 1,000 and multiplied by the recorded difference in weight of the filter.

Example:

219 ml. of water filtered, 0.110 grams difference,

$$\frac{1,000}{219} \_ \ 4.566 \times 110 \text{ mg.} = 502.26 \text{ mg/suspended solids}$$

U.S. Geological Survey water flow records were used to calculate sediment loading. If a particular sampling station did not have a stream flow gauge, the one nearest the station was used. If a sampling period was missed, the results from the two closest sampling periods were averaged to obtain a turbidity estimate for projected sediment tonnage.

Suspended sediment discharge for a particular day was calculated by multiplying flow (for that day) times mg/l of suspended sediment (obtained from the turbidity-suspended sediment linear regression formula for that drainage) times 0.0027.

The tons per month suspended sediment was calculated by multiplying the mean flow (cfs) for that month times the mean suspended sediment concentration of the two monthly samples times the number of days in that month times 0.0027. The total suspended sediment for the sampling period was divided by the number of days in that period to obtain the mean suspended sediment concentration per day. The mean daily flow for the entire sampling period was divided by the mean suspended sediment concentration for the sampling period to obtain a mean suspended sediment mean flow correlation factor for sediment discharge comparisons between various size streams.

RESULTS

Turbidity Testing

Turbidity concentrations expressed as NTU's varied in the Snake River considerably (Table 1). The highest concentrations occurred at the Tilden Bridge during 1976 when 55 and 80 NTU's occurred during the first and second sampling periods in March, respectively. The lowest turbidities in the Snake River at the various sampling stations occurred at the Pingree Access and the Highway 26 Bridge. Turbidity concentrations were generally higher at the Tilden Bridge in 1976 than in 1975.

Table 1. Turbidity concentrations along the Snake River in Region 5.

Location and year	March 1st	March 2nd	April 1st	April 2nd	May 1st	May 2nd	June 1st	June 2nd	July 1st	July 2nd	August 1st	August 2nd	September 1st	September 2nd
Pipeline Access below American Falls-1975	2	10	17	8	7	3	52	-	-	1	9	-	-	6
Pingree Access-1975	7	10	4	7	7	21	6	8	5	4	2	6	-	5
Tilden Bridge-1975	5	12	4	6	2	19	18	10	4	4	3	3	2	2
Tilden Bridge-1976	55	80	12	5	6	21	18	46	-	4	-	2	-	-
Highway 26 Bridge at Blackfoot - 1975	1	9	3	7	3	6	16	4	5	37	2	2	3	1
Shelley Bridge west of Shelley - 1975	1	8	3	-	3	33	21	9	10	37	3	10	2	-

Turbidity concentrations in the Portneuf River increased going downstream (Table 2). The highest river concentrations at the sampling locations occurred at the Interstate 80 Bridge west of Pocatello, while the lowest occurred immediately downstream from Chesterfield Reservoir. Turbidity concentrations at the Interstate 80 Bridge were higher in 1976 than in 1975 for the March through early May sampling periods. From mid-May through September, however, concentrations were higher in 1975 than 1976 at this location. At Lava Hot Springs river concentrations were normally higher in 1976 than in 1975. However, three exceptions to this occurred during the sampling period.

Turbidity concentrations were generally higher in Marsh Creek near its mouth. However, high concentrations occurred in this stream throughout its entire length (Table 3). From March through early May turbidities were higher in 1976 than in 1975. From mid-May through September turbidities were generally higher in 1975. Turbidity concentrations increased in early August in this stream after dropping in June and July. This increase was probably due to irrigation return flows. Rapid Creek, which enters the Portneuf River at Inkom, contained high turbidities during the spring runoff.

Turbidity concentrations in the Blackfoot River were highest at the Interstate 15 Bridge near Blackfoot (Table 4). Upstream from the tilled farmland the river contained low turbidity concentrations. Turbidities in 1976 were either higher or the same as in 1975 at the Interstate 15 Bridge and the Highway 34 Bridge. Unfortunately, some stations could not be sampled in the spring because of their inaccessibility.

Diamond Creek and Lanes Creek usually contained low turbidity concentrations (Table 5). Exceptions to this occurred during mid-September, 1975, in Lanes Creek and mid-September, 1976, in lower Diamond Creek. The increased concentrations in these two areas at that time may be due to cattle activity in the stream.

High turbidity concentrations occurred in the Bear River at the Weston Bridge, Cleveland Bridge, Bennington Bridge, Dingle Bridge, and the Border Bridge (Table 6). Concentrations were always higher in 1976 than 1975 at the Weston Bridge, the Highway 36 Bridge, the Cleveland Bridge (one exception) and the Bennington Bridge.

Major tributaries of the Bear River generally contained moderate turbidity concentrations (Table 7). Thomas Fork Creek contained the highest concentrations while those at Eight Mile Creek, Georgetown Creek and Montpelier Creek were low.

Table 2. Turbidity concentrations in the Portneuf River.

Location and year	March		April		May		June		July		August		September	
	1st	2nd	1st	2nd	1st	2nd	1st	2nd	1st	2nd	1st	2nd	1st	2nd
Interstate 80 Bridge, west of Pocatello-1975	94	25	13	26	34	150	31	23	10	4	33	20	4	7
Interstate 80 Bridge, west of Pocatello-1976	-	58	100	55	66	27	22	13	7	4	6	7	-	-
Inkom Bridge -1975	62	20	14	13	15	100	32	4	10	4	35	17	5	7
Highway 30 Bridge at McCammon -1975	4	3	1	7	4	97	38	16	3	1	13	5	2	4
Lava Hot Springs Center Street Bridge -1975	2	2	1	6	2	18	11	7	4	2	12	5	2	2
Lava Hot Springs Center Street Bridge -1976	40	28	35	22	18	22	-	2	5	2	2	4	2	1
Pebble Bridge -1975	2	1	12	10	4	14	11	4	2	4	4	2	1	2
Steel Bridge-Chesterfield Road -1975	2	4	17	15	5	28	12	3	3	3	2	2	5	6
Portneuf Canal-below Chesterfield Dam -1975	3	10	3	3	2	6	1	2	1	1	1	2	2	2

Table 3. Turbidity concentrations in Marsh Creek and Rapid Creek, tributaries to the Portneuf River.

Location and year	March		April		Ma		June		Jul		August		Septembe	
	1st	2nd	1st	2nd	1st	2nd	1st	2nd	1st	2nd	1st	2nd	1st	2nd
Marsh Creek-one mile up-stream from mouth -1975	160	32	32	44	23	150	34	13	8	4	40	16	5	11
Marsh Creek Bridge west of McCammon -1975	67	25	25	14	19	100	32	19	7	5	27	7	5	7
Marsh Creek Bridge west of McCammon -1976	-	83	100	72	84	38	11	-	8	2	3	5	-	-
Marsh Creek Bridge west of Arimo -1975	160	28	20	14	24	15	10	20	5	9	65	7	3	11
Marsh Creek Bridge west of Virginia -1975	90	31	21	22	24	7	4	9	10	26	150	5	4	26
Rapid Creek Bridge at Inkom -1976	-	52	58	27	37	45	4	-	2	3	3	4	-	-

Table 4. Turbidity concentrations in the Blackfoot River.

Location and year	March		April		May		June		July		August		September	
	1st	2nd	1st	2nd	1st	2nd	1st	2nd	1st	2nd	1st	2nd	1st	2nd
Interstate 15 Bridge at Blackfoot - 1975	52	10	7	54	35	37	-	-	7	7	1	10	3	5
Interstate 15 Bridge at Blackfoot - 1976	75	275	60	48	40	59	20	20	-	10	-	27	-	-
Morgans Bridge- 1975	-	-	-	-	- -	-	5	8	3	2	3	8	6	2
Government Dam Bridge - 1975	-	-	-	3	6	2	5	9	1	2	1	5	4	3
Highway 34 Bridge-1975	2	2	3	4	4	20	4	7	2	2	2	2	2	15
Highway 34 Bridge-1976	-	-	-	-	6	27	32	31	23	2'	2	-	2	50
Trail Creek Bridge-1975	-	-	-	-	-	44	4	6	5	1	2	2	1	2
Diamond Creek Bridge-Blackfoot River -1975	-	-	5	-	-	-	12	4	2	1	1	2	1	1

Table 5. Turbidity concentrations in Diamond Creek and Lanes Creek, tributaries to Blackfoot River.

	March		April		May		June		July		August		September	
Location and year	1st	2nd	1st	2nd	1st	2nd	1st	2nd	1st	2nd	1st	2nd	1st	2nd
Diamond Creek Bridge Lower crossing - 1975	-	-	1	-	-	-	-	5	2	1	1	1	1	1
Diamond Creek Bridge Lower crossing - 1976	-	-	-	-	-	16	15	17	3	3	2	-	1	60
Diamond Creek at Bear Canyon - 1975	-	-	-	-	-	-	-	8	2	1	2	1	3	1
Diamond Creek at Scout Camp - 1975	-	-	2	-	-	-	-	9	2	1	2	1	1	1
Lanes Creek at Sheep Lane - 1975	-	-	-	-	-	20	20	22	3	1	2	-	1	40

Table 6. Turbidity concentrations in the Bear River.

Location and year	March 1st	March 2nd	April 1st	April 2nd	May 1st	May 2nd	June 1st	June 2nd	July 1st	July 2nd	August 1st	August 2nd	September 1st	September 2nd
Weston (east) Bridge-1975	30	40	17	10	18	26	12	15	9	9	7	2	3	2
Weston (east) Bridge-1976	18	40	42	37	40	30	50	25	15	100	26	20	30	35
Preston (west)Bridge-1975	4	61	18	5	16	19	6	9	11	3	3	5	2	3
Highway 91 Bridge -1975	5	6	5	-	16	13	5	10	2	5	6	4	1	5
Highway 34 Bridge -1975	2	2	4	6	6	8	1	3	1	3	4	4	1	3
Highway 36 Bridge -1975	1	2	4	4	4	6	1	1	2	2	2	3	1	2
Highway 36 Bridge -1976	8	18	12	11	4	2	3	12	15	2	11	5	10	5
Oneida Dam Bridge -1975	1	3	3	2	3	5	1	1	3	3	2	2	2	2
Cleveland Bridge -1975	5	11	3		7	7	2	12	13	7	3	10	2	3
Cleveland Bridge -1976	-	78	22	14	3	13	22	26	17	22	110	11	17	21
Cheese Plant Bridge -1975	1	2	3	3	9	4	3	2	4	4	4	25	5	4
Black Canyon Access -1975	1	1	1	1	1	1	1		1		1	2	3	1

Table 6 (Continued) Turbidity concentrations in the Bear River.

Location and year	March		April		May		June		July		August		September	
	1st	2nd	1st	2nd	1st	2nd	1st	2nd	1st	2nd	1st	2nd	1st	2nd
Last Chance Dam (downstream)-1975	1	-	-	4	5	7	4	6	3	15	5	5	7	4
Alexander Dam (downstream)-1975	1	2	5	2	5	9	4	4	2	12	3	15	5	3
Hospital Bridge (Soda Springs)-1975	2	3	7	2	1	4	12	2	7	26	12	17	13	3
Eight Mile Bridge-1975	2	11	5	2	3	13	7	2	18	25	2	18	16	4
Georgetown Bridge-1975	4	18	8	5	4	15	12	5	13	11	26	13	18	7
Bennington Bridge-1975	2	24	12	5	-	6	15		11	5	28	17	15	3
Bennington Bridge-1976	45	38	26	17	32	31	-	22	175	32	120	-	85	75
Dingle Bridge -1975	2	27	22	125	78	65	72	10	13	45	15	12	9	6
Border Bridge -1975	5	16	21	140	82	110	26	38	22	46	19	7	11	11
Border Bridge -1976	60	33	120	64	86	28		17	25	18	20	-	65	60

Table 7. Turbidity concentrations in tributaries of the Bear River. Samples were collected at access points near the streams' mouth.

Location and year	March		April		May		June		July		August		September	
	1st	2nd	1st	2nd	1st	2nd	1st	2nd	1st	2nd	1st	2nd	1st	2nd
Cub River -1975	6	14	2	7	6	80	5	3	7	3	1	5	2	2
Mink Creek -1975	3	4	3	9	10	20	7	6	4	1	2	4	1	1
Cottonwood Creek-1975	-	4	2	48	20	36	12	3	2	1	1	1	2	2
Eight Mile Creek-1975	2	11	1	7	2	10	6	6	4	3	3	1	1	2
Georgetown Creek-1975	2	17	5	6	3	31	26	10	9	11	2	10	6	8
Montpelier Creek-1975	1	18	-	2	2	17	16	4	1	2	5	6	2	3
Thomas Fork Creek-1975	3	9	18	22	160	82	52	53	51	44	15	5	10	10

TURBIDITY-SUSPENDED SEDIMENT CORRELATIONS

The following formula was used to compute turbidity suspended sediment correlations:

$$Y=A + B (x)$$

Where:
Y= Suspended sediment
A= Constant at X=0
B= Regression coefficient
X= Turbidity value to use

Also calculated was the correlation coefficient (r), and the 95% confidence interval for the regression coefficient (Table 8). It appears that when sample size was adequate for a particular stream, correlations were excellent. When using a small sample size such as used for the Snake River, correlations were poor. In addition, correlations were poor when using all samples combined, probably because of the Snake River samples and different hydrological conditions for each stream. Correlation coefficients were high for the Portneuf River, Blackfoot River, and Bear River. Therefore, it can be assumed that turbidity suspended sediment calculations can be made using the linear regression formula developed for each stream. This is similar to correlations reported by Kunkle and Comer (1971).

SUSPENDED SEDIMENT DISCHARGE

The mean daily suspended sediment discharge in the Portneuf River at the Interstate 15 Bridge during the 1975 sampling period was 278 tons per day (Table 9). A high of 31,297 tons were discharged in May and a low of 837 tons in September. The mean daily suspended sediment mean flow correlation factor at this location was .51.

The mean daily suspended sediment discharge in the Portneuf River at Lava Hot Springs during the 1975 sampling period was 46 tons per day (Table 10). A high of 2,758 tons were discharged in June and a low of 721 tons in September. The mean daily suspended sediment mean flow correlation factor at this location was .15.

The mean daily suspended sediment discharge in the Portneuf River at the Pebble Creek Bridge in 1975 was 27 tons per day (Table 11). A high of 1,900 tons were discharged in May and a low of 320 tons in March. The mean daily suspended sediment mean flow correlation factor at this location was .17.

Table 8. Correlations between turbidity and suspended sediment in streams in Southeastern Idaho.

Stream	Number Samples Used	Linear regression formula	Correlation coefficient	Confidence limits (95%) for the regression coefficient
Portneuf River	10	Y=34.32067+ 3.31190(X)	.99464	3.03112 to 3.59268
Blackfoot River	7	Y=98.43915+19.30319(X)	.87131	6.80273 to 31.80365
Bear River	12	Y=15.31474+ 2.44880(X)	.97116	2.02526 to 2.87234
Snake River	3	Y=87.42857- 5.71429(X)	-.26806	-266.65957 to 255.23099
All Locations	32	Y=35.12402- 3.35792(X)	.74755	2.24560 to 4.47024

Table 9. Suspended sediment discharge in the Portneuf River at the Interstate 80 Bridge in 1975. Flow records are from U.S.G.S. gaging station number 13075500.

Month	Mean flow (cfs) by month	Mean suspended sediment concentration (mg/1)	Suspended sediment (tons/month)
March	498	232	9,670
April	542	99	4,346
May	1,103	339	31,297
June	1,016	123	10,122
July	272	57	1,298
August	197	123	2,028
September	195	53	837
Mean/day	546	147	278

$$\frac{\text{Mean suspended sediment}}{\text{Mean flow}} \quad \frac{278}{546} \quad .51$$

Table 10. Suspended sediment discharge in the Portneuf River at Lava Hot Springs in 1975. Flow records are from U.S.G.S. gaging station number 13073000.

Month	can flow (cfs) by month	Mean suspended sediment concentration (mg/1)	Suspended sediment (tons/month)
March	229	41	786
April	252	46	939
May	457	67	2,563
June	532	64	2,758
July	233	45	989
August	229	63	1,208
September	217	41	721
Mean/day	307	52	46

$$\frac{\text{Mean suspended sediment}}{\text{Mean flow}} \quad \frac{46}{-\ 307} = .15$$

Table 11. Suspended sediment discharge in the Portneuf River at the Pebble Creek Bridge in 1975. Flow records are from U.S.G.S. gaging station number 13072000.

Month	Mean flow (cfs) by month	Mean suspended sediment concentration (mg/1)	Suspended sediment (tons/month)
March	85	45	320
April	109	87	768
May	255	89	1,900
June	292	59	1,395
July	123	44	4 53
August	124	41	426
September	107	53	459
Mean/day	156	60	27

$$\frac{\text{Mean suspended sediment}}{\text{Mean flow}} \quad \frac{27}{156} = \underline{.17}$$

The mean daily suspended sediment discharge in Marsh Creek west of McCammon in 1975 was 43 tons per day (Table 12). A high of 3,403 tons were discharged in May and a low of 322 tons in September. The mean daily suspended sediment mean flow correlation factor at this location was .38.

The mean daily suspended sediment discharge in the Blackfoot River at the Interstate 15 Bridge in 1975 was 485 tons per day (Table 13). A high of 53,067 tons were discharged in June and a low of 0 tons in September. The mean daily suspended sediment mean flow correlation factor at this station was 1.08.

The mean daily suspended sediment discharge in the Blackfoot River at the Highway 34 Bridge in 1975 was 47 tons per day (Table 14). A high of 8,256 tons were discharged in May and a low of 0 tons during March, April, July and August. The mean daily suspended sediment mean flow correlation at this station was .16.

The mean daily suspended sediment discharge in the Bear River at the Weston Bridge in 1975 was 171 tons per day (Table 15). A high of 10,621 tons were discharged in May and a low of 2,472 tons in August. The mean daily suspended sediment mean flow correlation factor at this station was .14.

The mean daily suspended sediment discharge in the Bear River at the Highway 91 Bridge in 1975 was 351 tons per day (Table 16). A high of 36,063 tons were discharged in May and a low of 2,946 tons in August. The mean daily suspended sediment mean flow correlation factor at this station was .30.

The mean daily suspended sediment discharge in the Bear River at the bridge immediately downstream from Oneida Dam in 1975 was 68 tons per day (Table 17). A high of 3,222 tons were discharged in May and a low of 1,165 tons in March. The mean daily suspended sediment mean flow correlation factor at this station was .06.

The mean daily suspended sediment discharge in the Bear River at Alexander in 1975 was 81 tons per day (Table 18). A high of 4,453 tons were discharged in August and a low of 708 tons in March. The mean daily suspended sediment mean flow correlation factor at this station was .08.

The mean daily suspended sediment discharge in the Bear River at Soda Springs in 1975 was 98 tons per day (Table 19). A high of 6,042 tons were discharged in July and a low of 591 tons in March. The mean daily suspended sediment mean flow correlation factor at this station was .11.

Table 12. Suspended sediment discharge in Marsh Creek at the road crossing west of McCammon in 1975. Flow records are from U.S.G.S. gaging station number 13075000.

Month	Mean flow (cfs) by month	Mean suspended sediment concentration (mg/1)	Suspended sediment (tons/month)
March	154	187	2,410
April	116	99	930
May	176	231	3,403
June	134	119	1,292
July	79	54	357
August	67	91	510
September	76	54	332
Mean/day	114	119	43

$$\frac{\text{Mean suspended sediment}}{\text{Mean flow}} = \frac{43}{114} = .38$$

Table 13. Suspended sediment discharge in the Blackfoot River at the Interstate 15 Bridge in 1975. Records are from U.S.G.S. gaging station number 130685000, a total of the river and the bypass canal flows.

Month	Mean flow (cfs) by month	Mean suspended sediment concentration (mg/1)	Suspended sediment (tons/month)
March	181	500	7,575
April	453	491	18,016
May	1,062	597	53,067
June	863	327	22,858
July	316	37	979
August	326	47	1,282
September	206	0	0
Mean/day	450	286	485

$$\frac{\text{Mean suspended sediment}}{\text{Mean flow}} = \frac{485}{450} = \underline{1.08}$$

Table 14. Suspended sediment discharge in the Blackfoot River at the Highway 34 Bridge in 1975. Flow records are from U.S.G.S. gaging station number 13063000.

Month	Mean flow (cfs) by month	Mean suspended sediment concentration (mg/1)	Suspended sediment (tons/month)
March	74	0	0
April	98	0	0
May	685	144	8,256
June	651	19	1,002
July	229	0	0
August	136	0	0
September	107	95	823
Mean/day	283	37	47

$$\frac{\text{Mean suspended sediment}}{\text{Mean flow}} = \frac{47}{283} = .16$$

Table 15. Suspended sediment discharge in the Bear River at the Weston Bridge in 1975. Flow records are from U.S.G.S. gaging station number 10092700.

Month	Mean flow (cfs) by month	Mean suspended sediment concentration (mg/1)	Suspended sediment (tons/month)
March	852	101	7,202
April	1,083	48	4,211
May	1,839	69	10,621
June	1,449	48	5,634
July	1,078	37	3,338
August	1,136	26	2,472
September	1,302	22	3,179
Mean/day	1,255	50	171

$$\frac{\text{Mean suspended sediment}}{\text{Mean discharge}} = \frac{171}{1,255} - .14$$

Table 16. Suspended sediment discharge in the Bear River at the Highway 91 Bridge northwest of Preston in 1975. Flow records are from U.S.G.S. gaging station number 10090500.

Month	Mean flow (cfs) by month	Mean suspended sediment concentration (mg/1)	Suspended sediment (tons/month)
March	682	58	3,311
April	957	38	2,946
May	1,703	253	36,063
June	1,350	95	10,388
July	995	73	6,080
August	1,124	95	8,937
September	1,203	75	7,308
Mean/day	1,159	98	351

$$\frac{\text{Mean suspended sediment}}{\text{Mean flow}} = \frac{351}{1,159} = .30$$

Table 17. Suspended sediment discharge in the Bear River at the bridge immediately downstream from Oneida Dam in 1975. Flow records are from U.S.G.S. gaging station number 10086500.

Month	Mean flow (cfs) by month	Mean suspended sediment concentration (mg/1)	Suspended sediment (tons/month)
March	663	21	1,165
April	941	22	1,677
May	1,540	25	3,222
June	1,238	18	1,805
July	1,088	23	2,094
August	1,243	20	2,081
September	1,297	23	2,416
Mean/day	1,144	22	68

$$\frac{\text{Mean suspended sediment}}{\text{Mean flow}} = \frac{68}{1,144} = .06$$

Table 18. Suspended sediment discharge in the Bear River at Alexander in 1975. Flow records are from U.S.G.S. gaging station number 10079500.

Month	Mean flow (cfs) by month	Mean suspended sediment concentration (mg/1)	Suspended sediment (tons/month)
March	445	19	708
April	641	24	1,246
May	942	33	2,602
June	1,015	25	2,055
July	1,308	33	3,612
August	1,438	37	4,453
September	1,289	25	2,610
Mean/day	1,011	28	81

$$\frac{\text{Mean suspended sediment}}{\text{Mean flow}} = \frac{81}{1,011} = .08$$

Table 19. Suspended sediment discharge in the Bear River at Soda Springs in 1975. Flow records are from U.S.G.S. gaging station number 10075000.

Month	Mean flow (cfs) by month	Mean suspended sediment concentration (mg/1)	Suspended sediment (tons/month)
March	321	22	591
April	533	26	1,122
May	789	22	1,453
June	948	32	2,457
July	1,289	56	6,042
August	1,393	51	5,946
September	1,214	35	3,442
Mean/day	927	35	98

$$\frac{\text{Mean suspended sediment}}{\text{Mean flow}} = \frac{98}{927} = 11$$

The mean daily suspended sediment discharge in the Bear River at the Bennington Bridge in 1975 was 243 tons per day (Table 20). A high of 26,864 tons were discharged in August and a low of 239 tons in March. The daily mean suspended sediment mean flow correlation factor at this station was .33.

The mean daily suspended sediment discharge in the Bear River at Dingle in 1975 was 242 tons per day (Table 21). A high of 15,663 tons were discharged in June and a low of 553 tons in September. The mean daily suspended sediment mean flow correlation factor at this location was .32.

The mean daily suspended sediment discharge in the Bear River at Border in 1975 was 255 tons per day (Table 22). A high of 18,173 tons were discharged in May and a low of 905 tons in September. The mean daily suspended sediment mean flow correlation factor at this location was .32.

The lower portion of the Portneuf River has a high suspended mean daily flow correlation, while that portion upstream from Lava Hot Springs has a low. The Blackfoot River has an extremely high correlation factor (1.08) at the Interstate 15 Bridge and a low factor (.16) at the Highway 34 Bridge just before it enters Blackfoot Reservoir. The correlation factors for various sampling locations on the Bear River varied somewhat, but not as much as either the Blackfoot River or the Portneuf River. The mainstem Bear River reservoirs appeared to settle out silt as the lowest correlation factors occurred immediately downstream from Oneida Dam and Alexander Dam. The river from Bennington to Border had the highest correlation factor and varied little (32-33) between the three upper stations.

DISCUSSION

High turbidity concentrations occurred in the lower sections of the Portneuf River, the Blackfoot River, the Snake River in the Tilden Bridge area, and at numerous locations in the Bear River. Turbidity concentrations in these areas greatly effected the trout populations which were low in stream sections having high turbidity. As an example, in the Bear River fishing pressure and trout populations occur downstream from Alexander Dam and Oneida Dam, and in the Last Chance-Black Canyon sections (Heimer, 1974), areas which are low in turbidity. It appears that the mainstem reservoirs located upstream from each of these areas tend to settle out the river silt.

Table 20. Suspended sediment discharge in the Bear River at the Bennington Bridge in 1975. Flow records are from U.S.G.S. gaging station number 10068500.

Month	Mean flow (cfs) by month	Mean suspended sediment concentration	Suspended sediment (tons/month)
March	168	17	239
April	323	27	706
May	534	51	2,279
June	607	43	2,114
July	1,171	110	10,781
August	1,310	245	26,864
September	1,091	103	9,102
Mean/day	744	85	243

$$\frac{\text{Mean suspended sediment}}{\text{Mean flow}} - \frac{243}{744} = .33$$

Table 21. Suspended sediment discharge in the Bear River at Dingle in 1975. Flow records are from U.S.G.S. gaging station number 10046000.

Month	Mean flow (cfs) by month	Mean suspended sediment concentration (mg/l)	Suspended sediment (tons/month)
March	299	51	1,276
April	441	195	6,966
May	907	191	14,500
June	1,667	116	15,663
July	1,494	95	11,243
August	398	49	1,632
September	207	33	553
Mean/day	762	104	242

$$\frac{\text{Mean suspended sediment}}{\text{Mean flow}} - \frac{242}{762} \quad .32$$

Table 22. Suspended sediment discharge in the Bear River at Border, Wyoming in 1975. Flow records are from U.S.G.S. gaging station number 100395000.

Month	Mean flow (cfs) by Month	Mean suspended sediment concentration (mg/1)	Suspended sediment (tons/month)
March	301	41	1,033
April	384	213	6,625
May	865	251	18,173
June	1,844	93	13,891
July	1,497	99	12,405
August	392	47	1,542
September	266	42	905
Mean/day	792	112	255

$$\frac{\text{Mean suspended sediment}}{\text{Mean flow}} - \frac{255}{792} = \frac{32}{}$$

Correlations between turbidity and suspended sediment appeared excellent for a particular stream. With a regression formula and a turbidity test for a stream its suspended sediment concentration can be calculated, a much easier process than determining its suspended sediment concentrations.

The lower sections of major streams in southeastern Idaho discharge high amounts of suspended sediment annually. To accomplish significant reductions in sediment discharge, numerous soil conservation measures must be put into effect. Their costs may be high when considering their benefits; consequently, in the future we can expect high turbidities and low game fish populations in many stream sections. The establishment of game fish species more tolerant of high turbidity concentrations could partially offset this problem.

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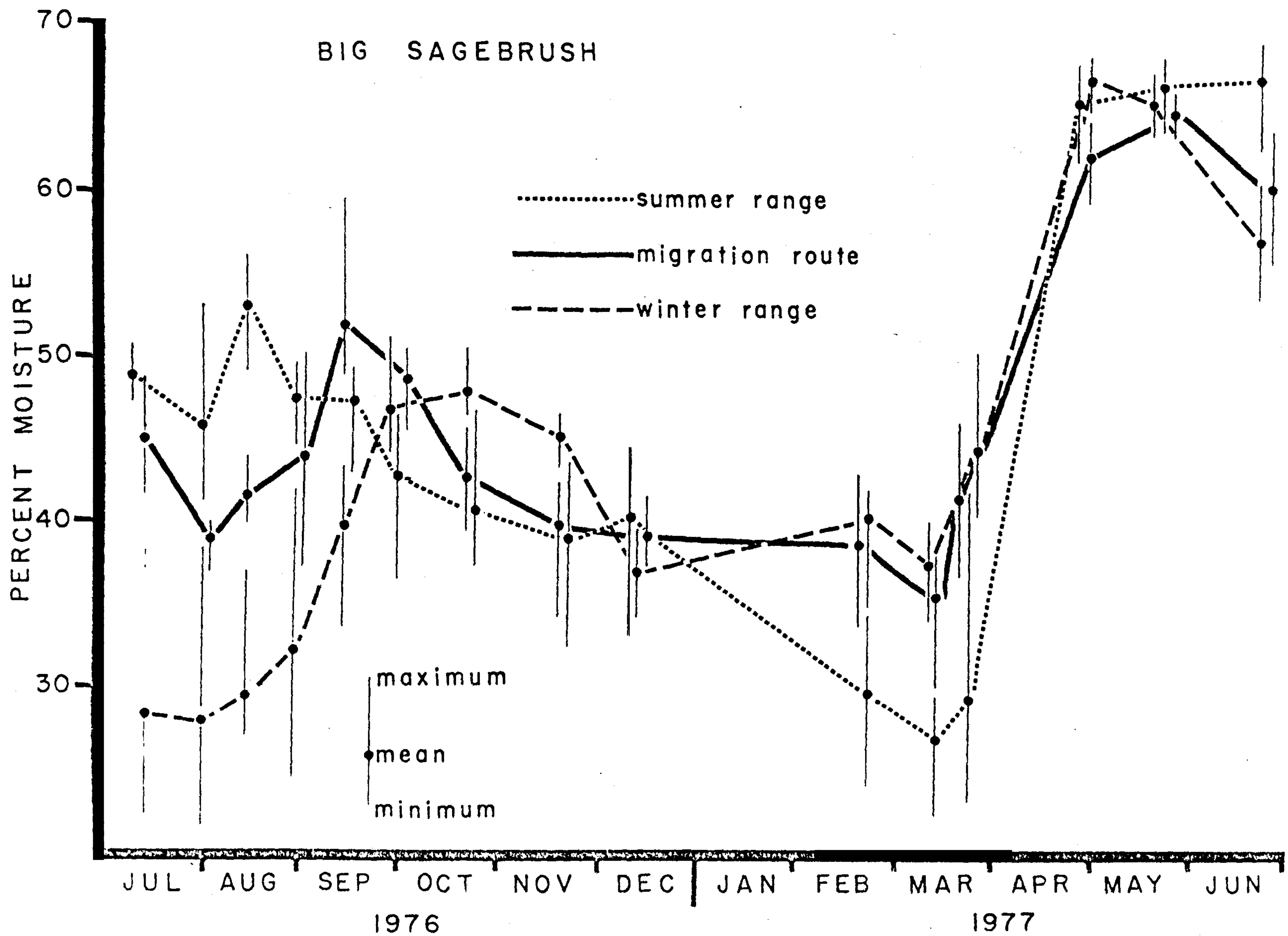
FIGURE 5


BIG SAGEBRUSH
summer range
migration route
winter range
maximum
mean
minimum
PERCENT MOISTURE
70
60
50
40
30
JUL
AUG
SEP
OCT
NOV
DEC
JAN
FEB
MAR
APR
MAY
JUN
1976
1977